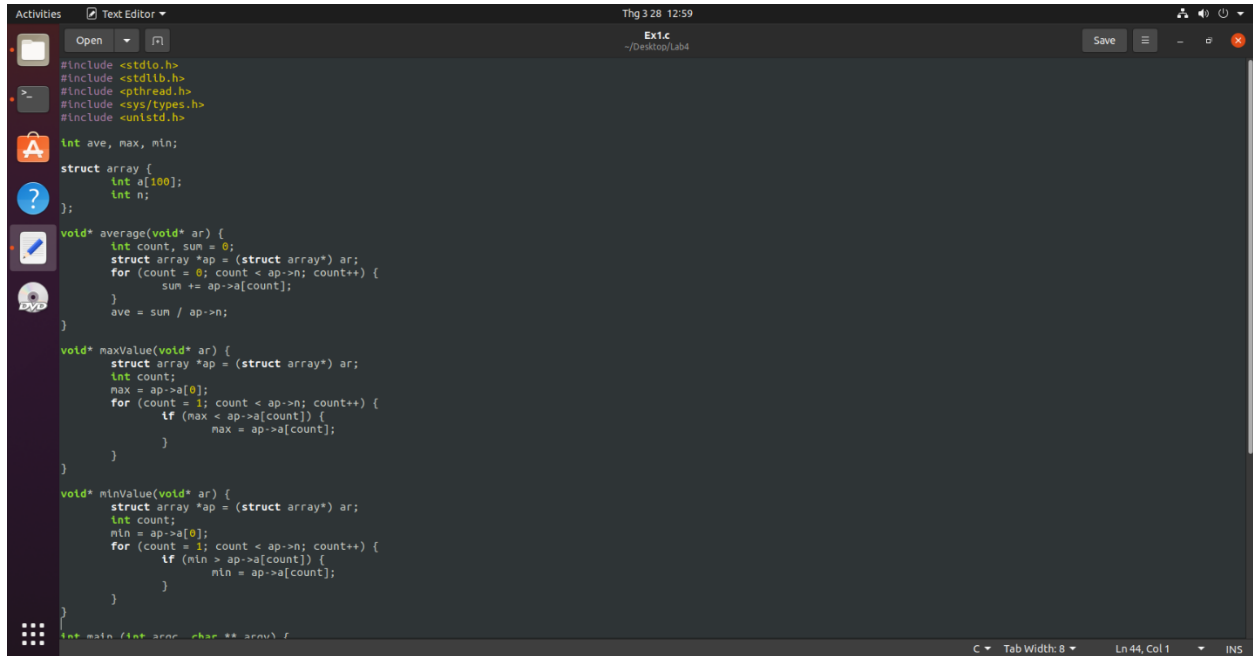


LAB 4

4.1 – Tạo tiểu trình con

Bài 1:



```
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <sys/types.h>
#include <unistd.h>

int ave, max, min;

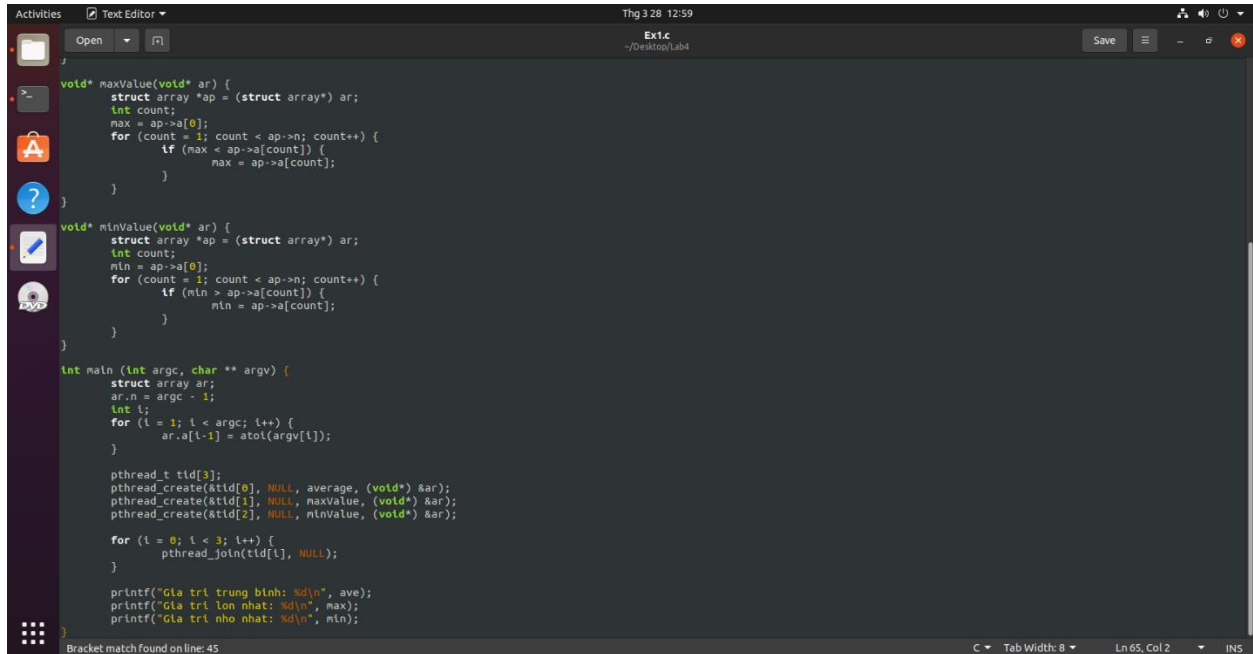
struct array {
    int a[100];
    int n;
};

void* average(void* ar) {
    int count, sum = 0;
    struct array *ap = (struct array*) ar;
    for (count = 0; count < ap->n; count++) {
        sum += ap->a[count];
    }
    ave = sum / ap->n;
}

void* maxValue(void* ar) {
    struct array *ap = (struct array*) ar;
    int count;
    max = ap->a[0];
    for (count = 1; count < ap->n; count++) {
        if (max < ap->a[count]) {
            max = ap->a[count];
        }
    }
}

void* minValue(void* ar) {
    struct array *ap = (struct array*) ar;
    int count;
    min = ap->a[0];
    for (count = 1; count < ap->n; count++) {
        if (min > ap->a[count]) {
            min = ap->a[count];
        }
    }
}

int main (int argc, char ** argv) {
```



```
}

void* maxValue(void* ar) {
    struct array *ap = (struct array*) ar;
    int count;
    max = ap->a[0];
    for (count = 1; count < ap->n; count++) {
        if (max < ap->a[count]) {
            max = ap->a[count];
        }
    }
}

void* minValue(void* ar) {
    struct array *ap = (struct array*) ar;
    int count;
    min = ap->a[0];
    for (count = 1; count < ap->n; count++) {
        if (min > ap->a[count]) {
            min = ap->a[count];
        }
    }
}

int main (int argc, char ** argv) {
    struct array ar;
    ar.n = argc - 1;
    int i;
    for (i = 1; i < argc; i++) {
        ar.a[i-1] = atoi(argv[i]);
    }

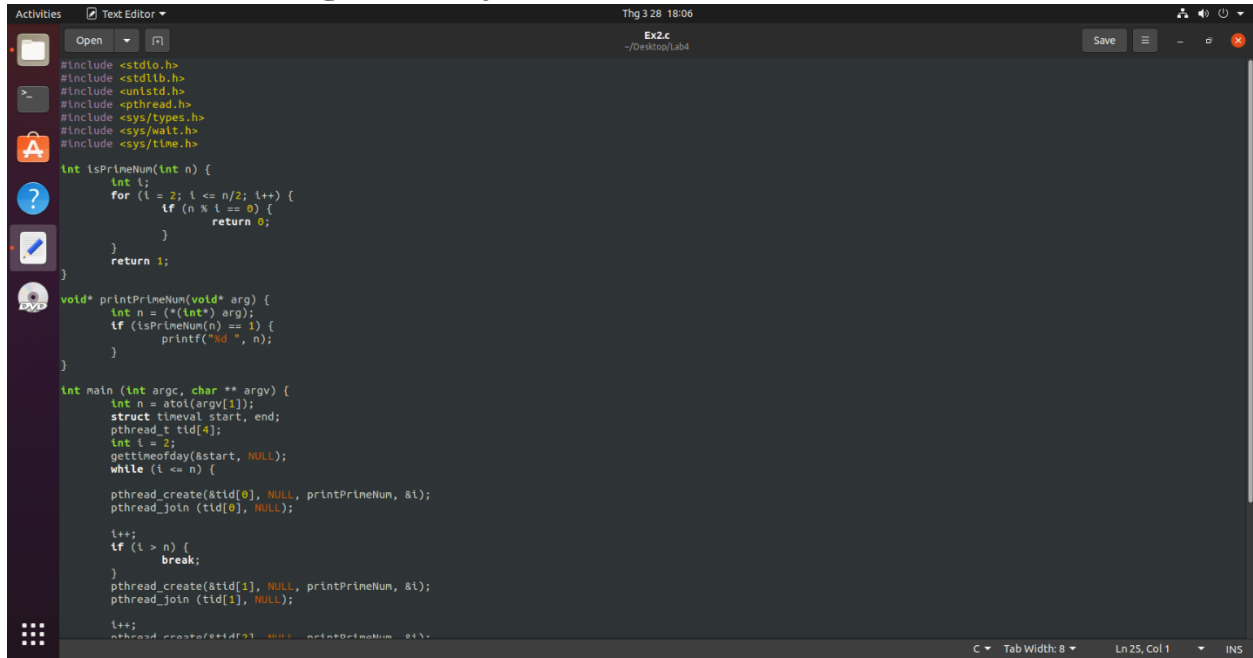
    pthread_t tid[3];
    pthread_create(&tid[0], NULL, average, (void*) &ar);
    pthread_create(&tid[1], NULL, maxValue, (void*) &ar);
    pthread_create(&tid[2], NULL, minValue, (void*) &ar);

    for (i = 0; i < 3; i++) {
        pthread_join(tid[i], NULL);
    }

    printf("Gia tri trung binh: %d\n", ave);
    printf("Gia tri lon nhat: %d\n", max);
    printf("Gia tri nho nhat: %d\n", min);
}
```

```
Activities Terminal Thg 3 28 12:59
asus@asus-virtual-machine: ~/Desktop/Lab4
asus@asus-virtual-machine:~$ cd Desktop
asus@asus-virtual-machine:~/Desktop$ cd Lab4
asus@asus-virtual-machine:~/Desktop/Lab4$ gcc -c Ex1.c
asus@asus-virtual-machine:~/Desktop/Lab4$ gcc -o Ex1.out Ex1.o -lpthread
asus@asus-virtual-machine:~/Desktop/Lab4$ ./Ex1.out 90 81 78 95 79 72 85
Gia tri trung binh: 82
Gia tri lon nhat: 95
Gia tri nho nhat: 72
asus@asus-virtual-machine:~/Desktop/Lab4$
```

Bài 2 + tính thời gian xử lý



```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <pthread.h>
#include <sys/types.h>
#include <sys/wait.h>
#include <sys/time.h>

int isPrimeNum(int n) {
    int i;
    for (i = 2; i <= n/2; i++) {
        if (n % i == 0) {
            return 0;
        }
    }
    return 1;
}

void* printPrimeNum(void* arg) {
    int n = *(int*) arg;
    if (isPrimeNum(n) == 1) {
        printf("%d ", n);
    }
}

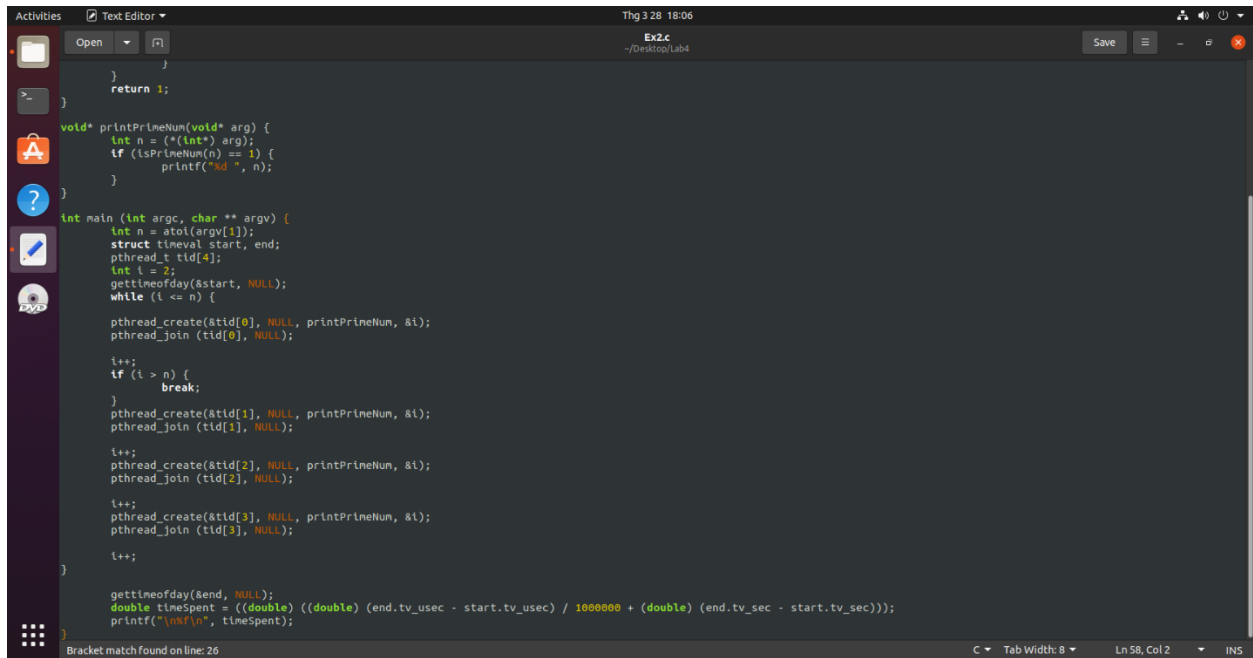
int main (int argc, char ** argv) {
    int n = atoi(argv[1]);
    struct timeval start, end;
    pthread_t tid[4];
    int i = 2;
    gettimeofday(&start, NULL);
    while (i <= n) {
        pthread_create(&tid[0], NULL, printPrimeNum, &i);
        pthread_join (tid[0], NULL);

        i++;
        if (i > n) {
            break;
        }
        pthread_create(&tid[1], NULL, printPrimeNum, &i);
        pthread_join (tid[1], NULL);

        i++;
        pthread_create(&tid[2], NULL, printPrimeNum, &i);
        pthread_join (tid[2], NULL);

        i++;
        pthread_create(&tid[3], NULL, printPrimeNum, &i);
        pthread_join (tid[3], NULL);

        i++;
    }
    gettimeofday(&end, NULL);
    double timeSpent = ((double) ((double) (end.tv_usec - start.tv_usec) / 1000000 + (double) (end.tv_sec - start.tv_sec)));
    printf("Time spent: %f\n", timeSpent);
}
```



```
        i++;
        pthread_create(&tid[1], NULL, printPrimeNum, &i);
        pthread_join (tid[1], NULL);

        i++;
        pthread_create(&tid[2], NULL, printPrimeNum, &i);
        pthread_join (tid[2], NULL);

        i++;
        pthread_create(&tid[3], NULL, printPrimeNum, &i);
        pthread_join (tid[3], NULL);

        i++;
    }

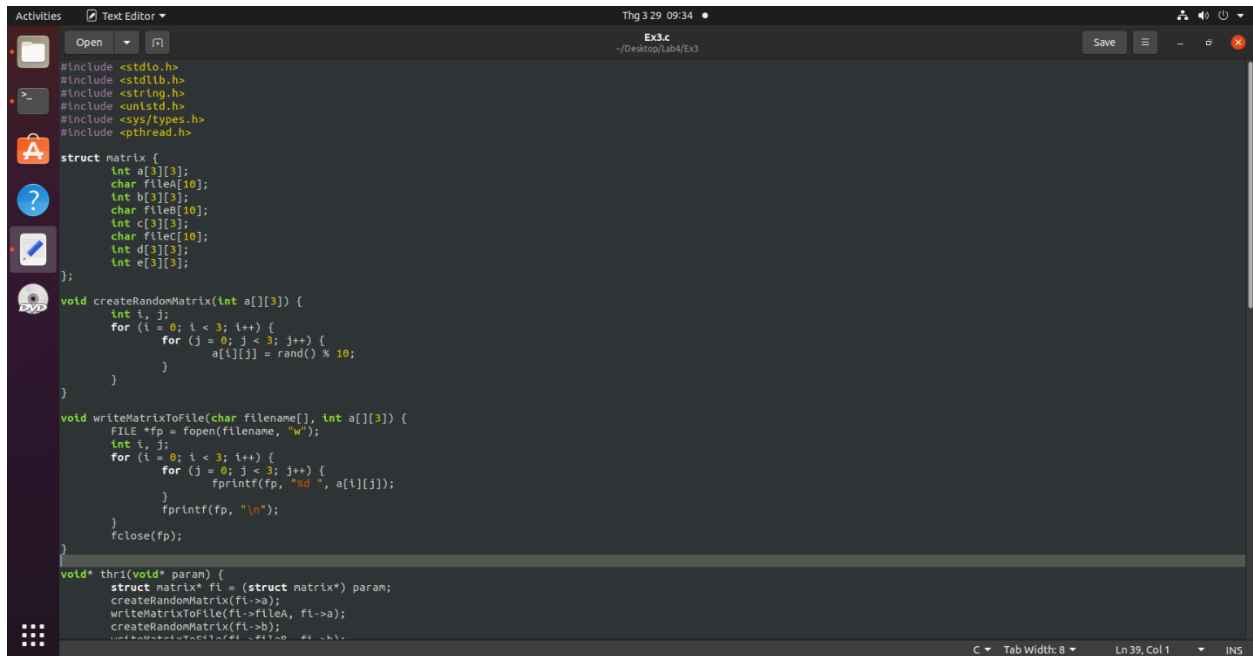
    gettimeofday(&end, NULL);
    double timeSpent = ((double) ((double) (end.tv_usec - start.tv_usec) / 1000000 + (double) (end.tv_sec - start.tv_sec)));
    printf("Time spent: %f\n", timeSpent);
}
```

Bracket match found on line: 26

```
Activities Terminal Thg 3 28 18:06
asus@asus-virtual-machine: ~/Desktop/Lab4
asus@asus-virtual-machine:~$ cd Desktop
asus@asus-virtual-machine:~/Desktop$ cd Lab4
asus@asus-virtual-machine:~/Desktop/Lab4$ gcc -c Ex2.c
asus@asus-virtual-machine:~/Desktop/Lab4$ gcc -o Ex2.out Ex2.o -lpthread
asus@asus-virtual-machine:~/Desktop/Lab4$ ./Ex2.out 10
2 3 5 7
0.001970
asus@asus-virtual-machine:~/Desktop/Lab4$ ./Ex2.out 20
2 3 5 7 11 13 17 19
0.002181
asus@asus-virtual-machine:~/Desktop/Lab4$
```

4.3 – Thao tác tập tin

Bài 2:



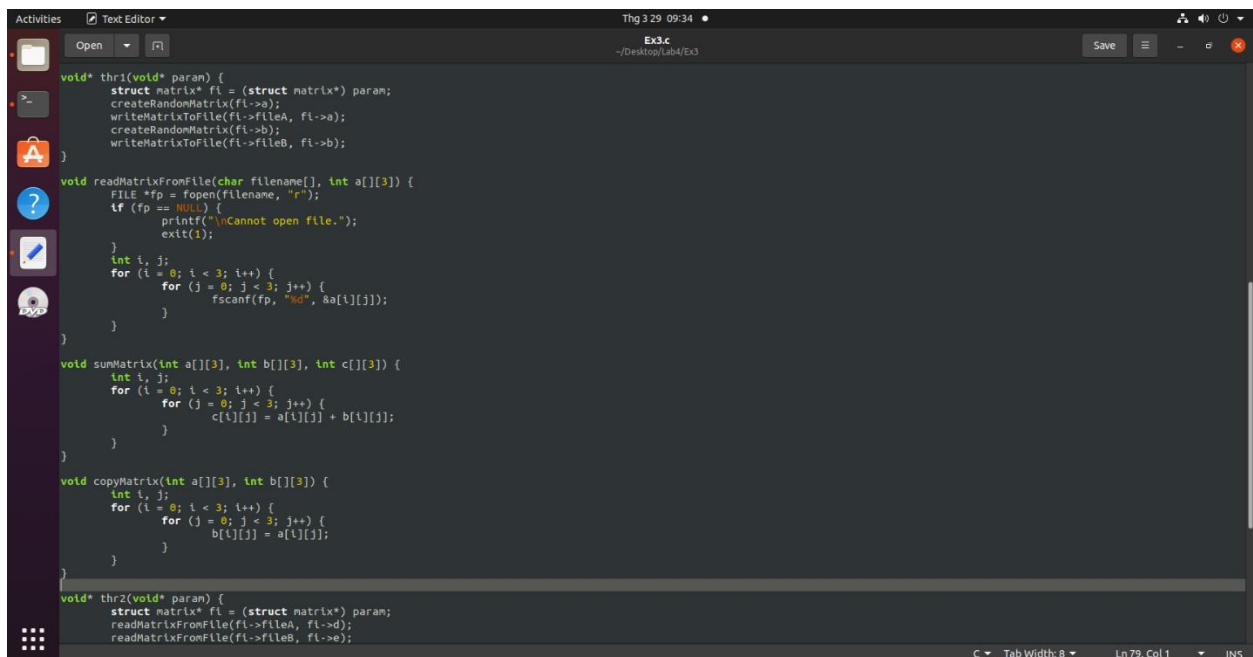
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <sys/types.h>
#include <pthread.h>

struct matrix {
    int a[3][3];
    char fileA[10];
    int b[3][3];
    char fileB[10];
    int c[3][3];
    char fileC[10];
    int d[3][3];
    int e[3][3];
};

void createRandomMatrix(int a[3][3]) {
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            a[i][j] = rand() % 10;
        }
    }
}

void writeMatrixToFile(char filename[], int a[3][3]) {
    FILE *fp = fopen(filename, "w");
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            fprintf(fp, "%d ", a[i][j]);
        }
        fprintf(fp, "\n");
    }
    fclose(fp);
}

void* thr1(void* param) {
    struct matrix* fl = (struct matrix*) param;
    createRandomMatrix(fl->a);
    writeMatrixToFile(fl->fileA, fl->a);
    createRandomMatrix(fl->b);
    writeMatrixToFile(fl->fileB, fl->b);
}
```



```
void* thr1(void* param) {
    struct matrix* fl = (struct matrix*) param;
    createRandomMatrix(fl->a);
    writeMatrixToFile(fl->fileA, fl->a);
    createRandomMatrix(fl->b);
    writeMatrixToFile(fl->fileB, fl->b);
}

void readMatrixFromFile(char filename[], int a[3][3]) {
    FILE *fp = fopen(filename, "r");
    if (fp == NULL) {
        printf("\nCannot open file.");
        exit(1);
    }
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            fscanf(fp, "%d", &a[i][j]);
        }
    }
}

void sumMatrix(int a[3][3], int b[3][3], int c[3][3]) {
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            c[i][j] = a[i][j] + b[i][j];
        }
    }
}

void copyMatrix(int a[3][3], int b[3][3]) {
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            b[i][j] = a[i][j];
        }
    }
}

void* thr2(void* param) {
    struct matrix* fl = (struct matrix*) param;
    readMatrixFromFile(fl->fileA, fl->a);
    readMatrixFromFile(fl->fileB, fl->b);
}
```

```
Activities Text Editor Thg 3 29 09:34
Ex3.c
~/Desktop/Lab4/Ex3

}

void sumMatrix(int a[][3], int b[][3], int c[][3]) {
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            c[i][j] = a[i][j] + b[i][j];
        }
    }
}

void copyMatrix(int a[][3], int b[][3]) {
    int i, j;
    for (i = 0; i < 3; i++) {
        for (j = 0; j < 3; j++) {
            b[i][j] = a[i][j];
        }
    }
}

void* thr2(void* param) {
    struct matrix* fi = (struct matrix*) param;
    readMatrixFromFile(fi->fileA, fi->d);
    readMatrixFromFile(fi->fileB, fi->e);
    sumMatrix(fi->d, fi->e, fi->c);
    writeMatrixToFile(fi->fileC, fi->c);
}

void main(int argc, char** argv) {
    pthread_t tld[2];
    struct matrix ABC;

    strcpy(ABC.fileA, argv[1]);
    strcpy(ABC.fileB, argv[2]);
    strcpy(ABC.fileC, argv[3]);

    srand(time(NULL));

    pthread_create(&tld[0], NULL, thr1, (void *) &ABC);
    pthread_join(tld[0], NULL);

    pthread_create(&tld[1], NULL, thr2, (void *) &ABC);
    pthread_join(tld[1], NULL);
}

Bracket match found on line: 88
C Tab Width: 8 Ln 103, Col 2 INS
```

```
Activities Terminal Thg 3 29 09:32
asus@asus-virtual-machine: ~/Desktop/Lab4/Ex3

asus@asus-virtual-machine:~$ cd Desktop
asus@asus-virtual-machine:~/Desktop$ cd Lab4
asus@asus-virtual-machine:~/Desktop/Lab4$ cd Ex3
asus@asus-virtual-machine:~/Desktop/Lab4/Ex3$ gcc -c Ex3.c
asus@asus-virtual-machine:~/Desktop/Lab4/Ex3$ gcc -o Ex3.out Ex3.o -lpthread
asus@asus-virtual-machine:~/Desktop/Lab4/Ex3$ ./Ex3.out A.txt B.txt C.txt
asus@asus-virtual-machine:~/Desktop/Lab4/Ex3$
```

